# Case note
# ABB drives reduce energy consumption and improve productivity of cement plant

Chettinad Cement Corporation Ltd (CCCL) was the first cement plant in India to install variable speed drives for speed and torque control of various process fans.

ABB's ACS 1000 variable speed drives offer a broader speed range and achieved a considerable reduction in maintenance costs and energy consumption.

**CCCL's cement plant in Karikkali with an annual capacity of 1.2 million tons; Cement mill fan installed at the CCCL site; ACS 1000 controlling the motor**

## Indian cement industry

The Indian cement industry has experienced a continuous growth since its deregulation in the 1980s. India is now the world's second largest cement producing country after China. The industry is characterized by a high degree of fragmentation that has created intense competition. Spread across India there are 120 large plants belonging to 56 companies with an installed capacity of around 135 million tons. Both domestic and international companies try to consolidate their position in one of the most promising cement markets in the world. Due to decreasing demand, most of these plants are operating at reduced capacity with focus on energy conservation measures.

## Highlights

- High reliability & availability
- Reduced maintenance costs
- Speed range: 0 - 100%
- High efficiency
- Network power factor >0.95
- Harmonics within IEEE limits

## Energy efficient control

Cement plants are one of the largest consumers of energy. Their electrical energy costs account for about 15 – 20 percent of the total production cost. The large fans used in the production process consume a major part of electrical energy. Traditionally, Indian cement producers use Cascade converters (also called Slip Power Recovery Systems (SPRS)) to control the speed of process fans. However, due to inherent problems with SPRS such as operation in weak networks and increased harmonics, they are now considering the variable speed drive (VSD) solution. With the use of VSDs, the energy consumption can be reduced from 90 kWHs/ton to about 70 kWHs/ton of cement produced.

## CCCL

Chettinad Cement Corporation Ltd (CCCL), founded in 1962, is part of the Chettinad Group in India, which has interests in manufacturing, construction and trading business.
CCCL's plant in Karikkali has an annual capacity of about 1.2 million tons. It was the first cement plant in India to install variable speed drives for speed and torque control of bag house fan, raw mill fan, cement mill fan and preheater fan.

## Benefits of VSDs

### Energy efficient control

The method used to control the flow rate has not only a major impact on costs, but will also affect productivity. Of the available controls that can be retrofitted the least energy efficient is a damper and the most energy efficient is the variable speed drive. See Figure 1.

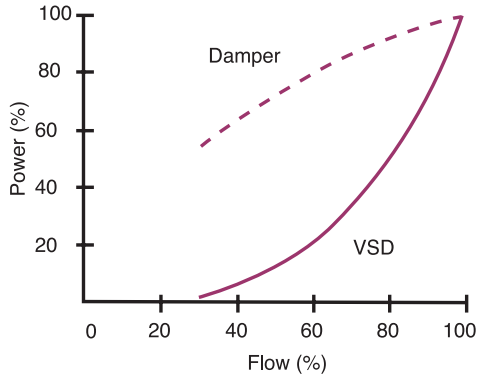


**Fig. 1: Graph showing fan power requirements for damper and VSD.**

### Flux optimization

Flux optimization of the ACS 1000 reduces the total energy consumption when the drive operates below the nominal load. The total efficiency can be improved by up to 10 percent.

### Wider range of speed control

Compared with the limited operating speed range of Cascade converters (60 – 100 percent), variable speed drives offer a much higher flexibility over the entire speed range (0 – 100 percent).

### Increased lifetime of equipment

Variable speed drives act as soft starters, causing no starting current peaks. This means reduced stress on electrical equipment and lower maintenance costs.

### Direct Torque Control (DTC)

The ACS 1000 motor control platform is based on DTC which achieves ultimate torque and speed performance. DTC allows the speed of any standard squirrel cage induction motor to be controlled without the need for expensive and fragile encoders or tachogenerator feedback devices.

### High reliability & availability

The ACS 1000 uses the IGCT (Integrated Gate Commutated Thyristor) power semiconductor as an integrated protection device. This leads to a lower parts count making the ACS 1000 a drive with outstanding reliability and availability.

### Low impact of power supply disturbances

Due to its RideThrough function, the drive system is able to withstand disturbances in power supply.

## Customer satisfaction

K Narayanan, Deputy General Manager, Chettinad Cement Corporation Ltd., states:
"Medium Voltage Variable Speed drives as a concept is new to the Indian cement industry. In comparison to traditionally used Slip Power Recovery Systems, ABB's MV AC drives offer much more flexibility in operating ranges like speed variation from 0 to 100 percent and a considerable reduction in maintenance costs. Also the high starting currents that are quite normal with any of the conventional starting circuits, belong to the past. VSD brings down the ratings of various components of starting circuits and reduce the strain. We are very pleased with the performance of ABB's ACS 1000 medium voltage drives."

| ACS 1000 key data | |
|---|---|
| Inverter type | Three-level Voltage Source Inverter (VSI) |
| Power range | Air cooling: 315 kW - 2 MW |
| | Water cooling: 1.8 MW - 5 MW |
| Output voltage | 2.3 kV, 3.3 kV, 4.0 kV, 4.16 kV (optional: 6.0 kV - 6.6 kV with step-up transformer) |
| Maximum output frequency | 66 Hz (optional: 82.5 Hz) |
| Converter efficiency | Typically > 98% |
| Type of motor | Induction motor |

For more information please contact:

**www.abb.com/drives**
**www.chettinadcement.com**

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